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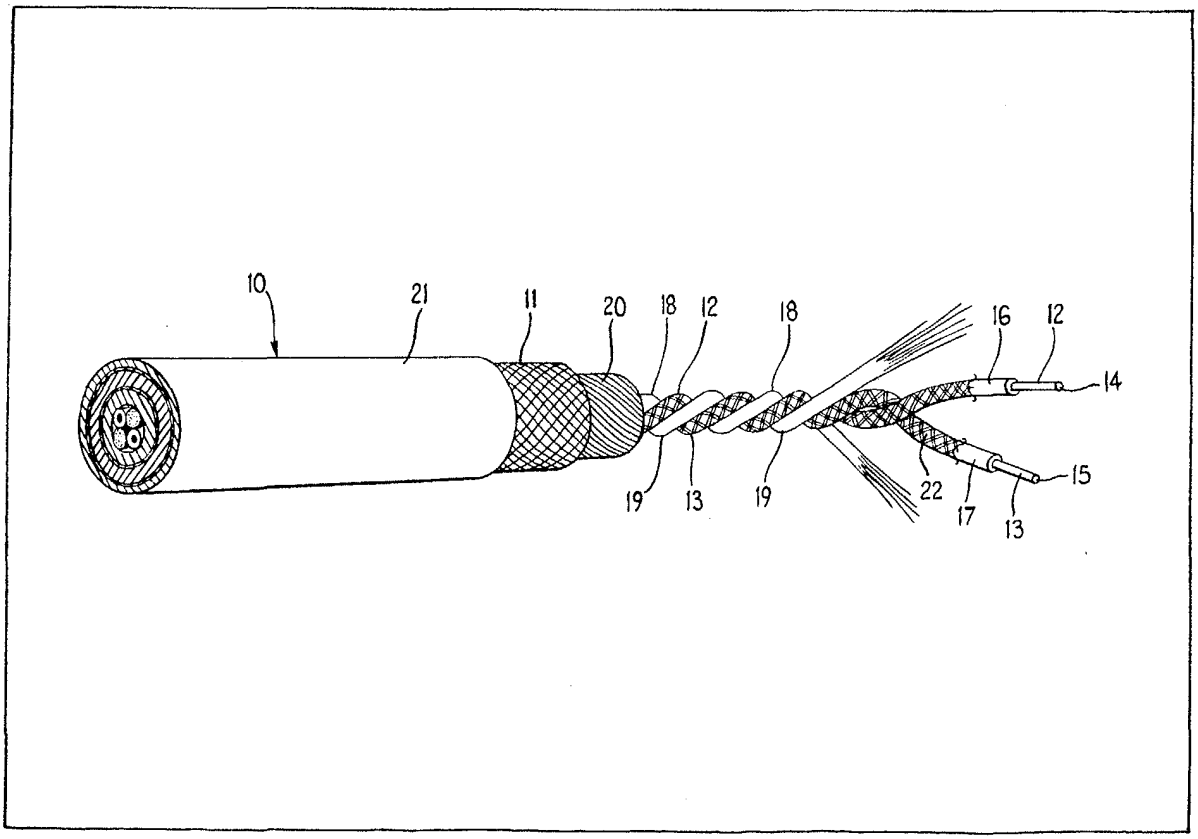
(54) **Electrical cables**

(57) A low noise electrical cable having an outer braided metal wire screening conductor 11 and a plurality of insulation covered conductors 12, 13 extending along the bore of the screening conductor 11. The conductors 12, 13 are each covered with a sheath of braided or woven carbon fibres. The conductors 12, 13 are twisted together and bundles of carbon fibres 18, 19 are laid in the helical grooves formed by twisting the conductors 12, 13 together. A sheath 20 of braided or woven carbon fibres is placed around the conductors 12, 13 and bundles of carbon fibres 18, 19 and the screening conductor 11 is placed in contact with the sheath 20 of carbon fibres. An outer layer 10 of insulation covers the whole cable.



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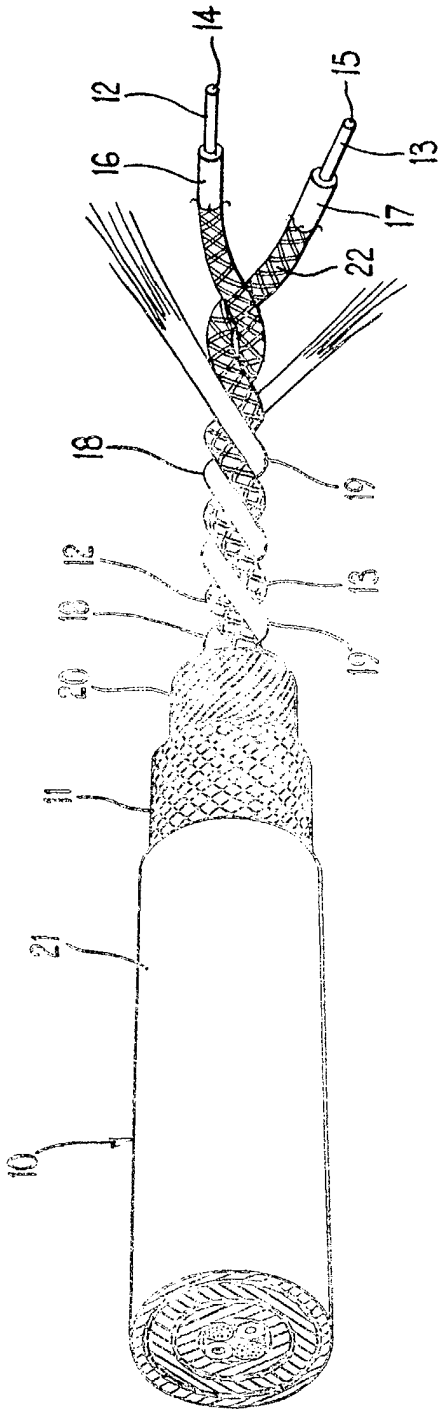
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SPECIFICATION

Electrical cables

This invention relates to electrical cables and is particularly concerned with low noise electrical cables.

Electrical noise is caused by electrical charges generated by relative movement of the conductors and insulation layers when a cagle is moved.

Conventional low noise cables discharge the electrical charges by providing a conductive path to an earthed connection. One form of known low noise cable comprises a number of insulation covered electrical conductors twisted together and disposed within a co-axial braided metal sheath which is itself covered by insulation. The insulation layer on each conductor is covered by a thin plastic tape, which is impregnated with graphite particles and which is wound around the conductors. The helical interstices formed when the conductors are twisted together are usually filled with ribbons, ropes, or strands of glass fibre or other electrical insulator material to produce a more round cable than would otherwise be possible. A thin plastic tape impregnated with graphite is wound around the conductors and filler ribbons to form a conductive layer onto which the metal braided sheath is assembled.

One of the problems with these known low noise cables resides in the graphite particles becoming detached from the tape and forming an electrical short between the conductors and the metal braided sheath when the end of the cable is prepared to form an electrical connection. To overcome this problem it is necessary to clean throughly the cables with alcohol, and in many cases this is not practical except in laboratory conditions. Furthermore, such cables are costly to manufacture because of the need to wind various layers of graphite impregnated tapes during the construction of the cable.

An object of the present invention is to provide a low noise electrical cable which is easy to manufacture, and does not exacerbate the problem of electrical shorts when forming electrical terminals or connections.

According to the present invention there is provided an electrical cable comprising a hollow cylindrical first conductor extending along the length of the cable, one or more insulation covered conductors extending along the bore of the first conductor, and a plurality of electrically conductive fibres extending along the cable in contact with the insulation covering the one or more insulation covered conductors and in electrically conductive contact with the first conductor.

The electrically conductive fibres may be provided in one or more layers around the, or each, insulation covered conductor.

In the case where there are a plurality of insulation covered conductors, they may be twisted together, and the electrically conductive fibres may then be used as fillers to fill the helical grooves formed by twisting the conductors together. If desired the electrical conductive fibres may be provided as one or more layers completely surrounding all of the insulation covered conductors.

Preferably the electrically conductive fibres are mixed with electrically non-conductive fibres providing that there are sufficient electrical conductive fibres in the mixture so as to render the mixture as a whole effectively electrically conductive. The preferred electrically conducting fibres are carbon fibres arranged in loose tows, bundles, woven tapes, or braided sheaths.

The invention will now be described, by way of an example only, with reference to the accompanying drawing which shows a cable constructed in accordance with the present invention.

Referring to the drawing there is shown a low noise electrical cable 10 comprising a first hollow cylindrical conductor 11 extending along the length of the cable and two insulation covered conductors 12 and 13 extending along the bore of the first conductor 11.

Each conductor 12 and 13 comprises a central electrically conductive core 14, 15, covered by an electrical insulator 16, 17 a braided sheath of carbon fibres is assembled in intimate contact over the outside of the insulation 16, 17 of each conductor 12 and 13 the conductors 12 and 13 are then twisted together. Two bundles of carbon fibres 18, 19 are laid into the helical grooves formed by twisting the conductors 12 and 13 together and the bundles of carbon fibres are around the twisted conductors 12 and 13 effectively to fill the helical groove.

A braided sheath 20 of carbon fibres is then assembled around the outside of the twisted conductors 12, 13 and bundles of carbon fibres 18, 19 and pulled tight down on to the assembly. The sheath 20 is in intimate contact with the bore of first conductor 11 so as to provide an electrically conductive path so that electrical charges generated by movement of the insulation covered conductors and outer conductor 11 are conducted through the carbon fibres 16, 17, 18, 19 and 20 to the electrical conductor 11.

The electrical conductor 11 is pulled tight down on to the sheath of carbon fibres 20 and is itself covered with an electrical insulation material 21.

In the above described embodiment a sheath of carbon fibres is positioned around the insulation material on each conductor 12, 13, if desired this layer of carbon fibres may be omitted. Furthermore, in some cases it may be possible to omit the sheath of carbon fibres 20 providing that intimate contact can be achieved between the bundles of carbon fibre 18, 19 and the first conductor 11.

If desired non-conductive fibres such as, for example, glass fibres, sizal, cotton, wool or man-made synthetic fibres may be intermingled with the carbon fibres in the sheaths 16, 17 or 20 or in the bundles of carbon fibres 18 and 19. However, it should be borne in mind that the carbon fibres is to discharge any electrical charges generated within the cable through to the outer screening conductor 11. Therefore if non-conductive fibres are mixed with

the electrically conducting fibres there should be sufficient electrical conducting fibres to ensure electrical conducting paths are formed.

The first conductor may be in the form of an electrically conductive tape such as a thin ribbon of metal, or metalised plastic.

CLAIM

1. An electrical cable comprising a hollow cylindrical first conductor extending along the length of the cable, one or more insulation covered conductors extending along the bore of the first conductor, and a plurality of electrically conductive fibres extending along the cable in contact with the insulation covering the one or more insulation covered conductors and in electrically conductive contact with the first conductor.

2. An electrical cable according to claim 1 wherein the fibres are provided in one or more layers around the, or each, insulation covered conductors.

3. An electrical cable according to claim 1 or claim 2 wherein there are two or more insulation covered conductors twisted together, and the fibres are used as fillers to fill the helical grooves formed by twisting the conductors together.

4. An electrical cable according to any one of claims 1 to 3 wherein there are a plurality of insulation covered conductors and the electrically conductive fibres are provided as one or more layers completely surrounding all of the insulation covered conductors.

5. An electrical cable according to any one of claims 1 to 4 wherein the first conductor comprises a braided or woven sheath of metal wires.

6. An electrical cable according to any one of claims 1 to 4 wherein the first conductor comprises a helically wound electrically conductive tape.

7. An electrical cable according to any one of claims 1 to 6 wherein the fibres comprise carbon fibres.

8. An electrical cable according to any one of claims 1 to 6 wherein the fibres comprises fibres of semi conductive materials.

9. An electrical cable according to any one of claims 1 to 8 wherein the fibres are woven together.

10. An electrical cable according to any one of claims 1 to 9 wherein the fibres are fabricated as tapes.

11. An electrical cable according to any one of claims 1 to 10 wherein the fibres are woven in to a braided sheat.

12. An electrical cable according to any one of claims 1 to 10 wherein the electrically conductive fibres are mixed with electrically non-conductive fibres, there being sufficient electrically conductive fibres in the mixture so as to render the mixture as a whole effectively electrically conductive.

13. An electrical cable substantially as herein described with reference to, and as shown in, the accompanying drawing.

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